

WHAT IS CLAIMED IS:

- 1                    1.        A method of fabricating a semiconductor device in a silicon on  
2 insulator (SOI) substrate comprising the steps of:
  - 3                    a)        providing a semiconductor body including a silicon supporting  
4 substrate, a silicon oxide layer supported by the substrate, and a silicon layer overlying the  
5 silicon oxide layer;
  - 6                    b)        forming a semiconductor component in the silicon layer over a portion  
7 of the silicon oxide layer;
  - 8                    c)        forming an etch mask on a surface of the substrate opposite from the  
9 component;
  - 10                   d)        applying a preferential etchant to selectively etch the silicon in the  
11 substrate underlying the portion of the silicon oxide layer; and
  - 12                   e)        providing a metal layer in the etched portion of the substrate to provide  
13 heat removal from the component during operation of the component.
- 1                    2.        The method as defined by claim 1 wherein the metal layer comprises a  
2 refractory metal.
- 1                    3.        The method as defined by claim 2 wherein the metal layer further  
2 comprises gold, copper or aluminum over the refractory metal.
- 1                    4.        The method as defined by claim 3 wherein the refractory metal  
2 comprises titanium tungsten or titanium nitride.
- 1                    5.        The method as defined by claim 1 wherein step c) includes forming a  
2 silicon nitride layer on the surface of the substrate and then preferentially masking and  
3 etching the silicon nitride layer to expose the silicon in the substrate underlying the portion of  
4 the silicon oxide layer.
- 1                    6.        The method as defined by claim 5 wherein the silicon nitride layer is  
2 preferentially etched with a dry plasma, and the silicon is preferentially etched with  
3 potassium hydroxide.
- 1                    7.        The method as defined by claim 6 wherein the silicon nitride is  
2 preferentially etched with a plasma and the silicon is preferentially etched with a plasma.

1                   8.       The method as defined by claim 5 and further including a step after  
2 step d) of preferentially etching the exposed portion of the silicon oxide layer.

1                   9.       The method as defined by claim 8 wherein the silicon oxide layer is  
2 etched with a buffered HF acid.

1                   10.      The method as defined by claim 8 wherein the silicon oxide layer is  
2 etched with an ion plasma.

1                   11.      The method as defined by claim 1 and further including a step after  
2 step d) of preferentially etching the exposed portion of the silicon oxide layer.

1                   12.      The method as defined by claim 1 and further including a step before  
2 step c) of abrading the substrate surface opposite from the component to reduce the thickness  
3 of the supporting substrate.

1                   13.      The method as defined by claim 1 wherein step a) includes providing a  
2 bonded silicon on insulator wafer.

1                   14.      The method as defined by claim 1 wherein step a) comprises providing  
2 a silicon wafer with implanted silicon oxide layer therein.

1                   15.      A semiconductor device comprising:

2                   a)       a semiconductor body including a silicon supporting substrate, a  
3 silicon layer supported by the substrate, and a silicon layer overlying the silicon oxide layer,

4                   b)       a semiconductor component formed in the silicon layer overlying a  
5 portion of the substrate which has been removed by etching, and

6                   c)       a metal layer in the portion of the substrate removed by etching, the  
7 metal layer providing heat removal from the component.

1                   16.      The semiconductor device as defined by claim 15, wherein the silicon  
2 oxide layer overlying the portion of the substrate is removed, the metal layer abutting the  
3 silicon layer.

1                   17.      The semiconductor device as defined by claim 16, wherein the metal  
2 layer comprises a refractory metal.

1                    18.     The semiconductor device as defined by claim 17, wherein the metal  
2 layer comprises gold, aluminum or copper over the refractory metal.

1                    19.     The semiconductor device as defined by claim 17, wherein the  
2 refractory metal is titanium tungsten or titanium nitride.

1                    20.     The semiconductor device as defined by claim 15, wherein the metal  
2 layer abuts the silicon oxide layer.

1                    21.     The semiconductor device as defined by claim 20, wherein the metal  
2 layer comprises a refractory metal.

1                    22.     The semiconductor device as defined by claim 21, wherein the metal  
2 layer comprises gold over the refractory metal.

1                    23.     The semiconductor device as defined by claim 21, wherein the  
2 refractory metal comprises titanium tungsten.